ANNUAL REPORT

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SAULT STE. MARIE - KORAH - TARENTORUS

INTEGRATED SEWAGE SCHEME

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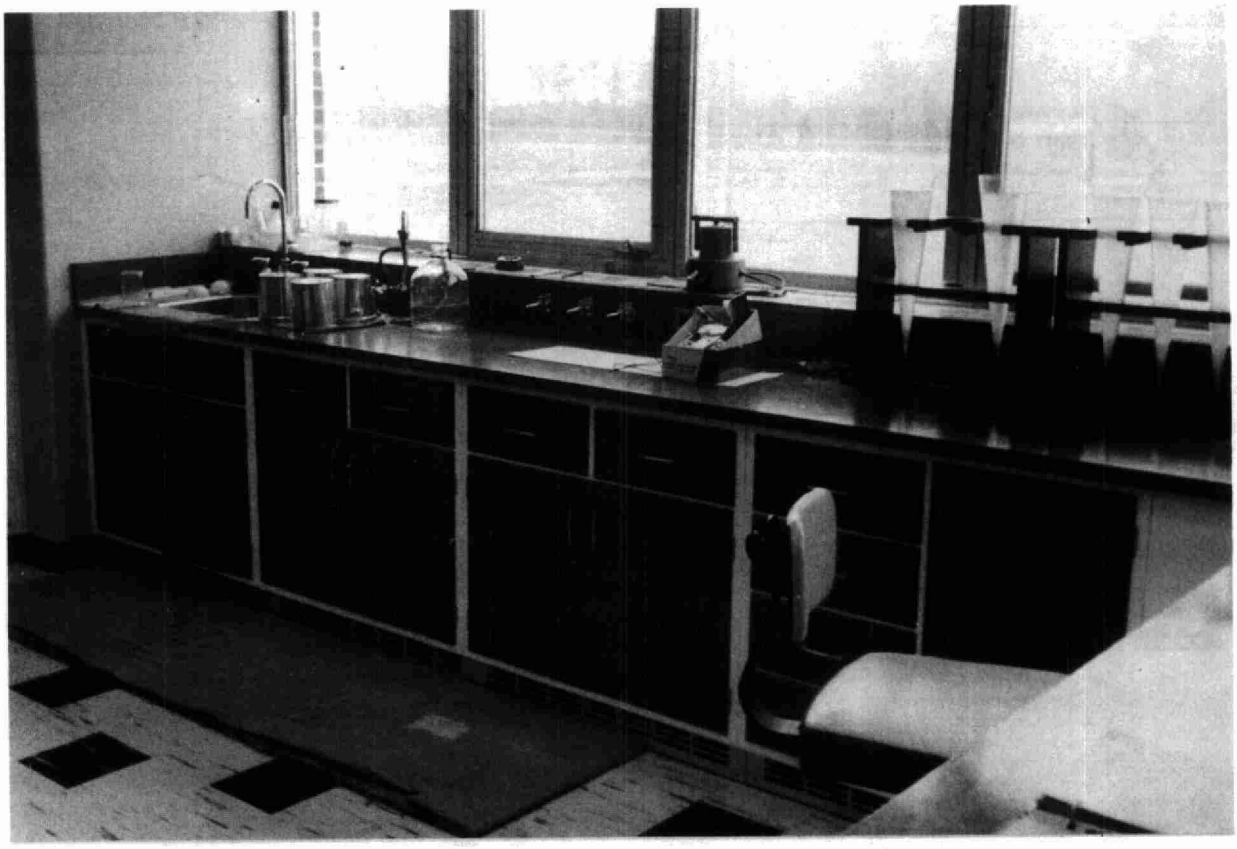
OWRC PROJECT # 58-S-20

VIEW OF PLANT AND LABORATORY



ANNUAL REPORT

ON

SAULT STE. MARIE - KORAH - TARENTORUS

INTEGRATED SEWAGE SCHEME

OPERATED BY

THE ONTARIO WATER RESOURCES COMMISSION

Mr. A. M. Snider	-	Chairman
Dr. A. E. Berry	-	General Manager
Mr. D. S. Caverly	-	Assistant General Manager, and Director of Plant Operations
Mr. B. C. Palmer	-	Assistant Director, Division of Plant Operations
Mr. P. J. Osmond	-	Project Engineer, Division of Plant Operations
Mr. C. K. Wilson	-	Construction Engineer, Construction Division

Prepared by the

Division of Plant Operations

PROJECT DEVELOPMENT

In 1952, the City of Sault Ste. Marie and the Townships of Korah and Tarentorus jointly decided to select a consultant to submit a report dealing with an interceptor sewer system which would collect sewage from all three municipalities and dispose of it at a central location.

This original report on the Integrated Sewage Works was submitted in November 1953 by Proctor and Redfern, Consulting Engineers. The recommendations contained were adopted by the municipalities and they proceeded with the first stage of the four stage program. This first stage, consisting of a sanitary interceptor running east from Goulais Avenue to John Street, was completed in 1955 at a cost of approximately $ 437,000.00.

By the spring of 1958, the three municipalities had completed negotiations with the OWRC for the three remaining stages of the integrated system. The Ontario Municipal Board gave their conditional approval in June 1958.

Tenders were called on the second stage of construction in November 1958. This stage included all sewers and forcemains between John Street and the site of the present sewage treatment plant. Previously tenders had been called on part of this stage, the section between John Street and Pim Street. However, due to the lack of contractor interest and high unit prices, it was decided to re-tender, this time including all the proposed trunk sewers and forcemains under one specification in two parts, Contracts A and B. Keystone Construction Limited of Windsor was awarded Contract A at $ 709,925.51, and Beaver Construction Company Limited of Montreal was awarded Contract B

at $ 652,249.00. These were the lowest of a total of seven bidders.

Both of the second stage contracts were completed in March 1961 at a total cost of $ 1,301,117.51, not including engineering fees, etc.

Tenders were received on May 20, 1960 for both the third and fourth stages of the integrated system.

The third stage was divided into two contracts, C and D. Contract C was for the construction of the Pim Street Pumping Station and Contract D was for the construction of the Clark Creek Pumping Station. L. R. Brown Company Limited of Sault Ste. Marie,who was the lowest of five bidders,was awarded both contracts at $ 468,534.00. This stage was completed in October 1961 at a cost of $ 459,691.42. In addition, approximately $ 67,707.00 was spent on equipment and $ 34, 856.00 for engineering fees, etc.

The fourth stage, which consisted of the primary treatment plant and the outfall sewer, was awarded to Matthews Concrete Limited of London at $ 825,873.00, the lowest of seven bids. This contract was completed on February 8, 1962 at a cost of $ 801,334.74. The additional costs to this stage include an equipment cost of approximately $ 240,294.00 and $ 76,756.00 for engineering fees, etc.

The integrated system commenced operation as a complete unit on February 9, 1962 and was officially opened on June 6, 1962 by Mr. A. M. Snider, Chairman of the OWRC, Mayor J. L. McIntyre of Sault Ste. Marie, Reeve D. W. Murray of Tarentorus Township and Reeve J. A. Allen of Korah Township.

FLOW PROCESS

Influent to the plant is metered in a Parshall flume before undergoing any treatment. At times when the flow exceeds the capacities of the treatment units, the excess can be by-passed over a fixed weir. This by-pass flow is coarse screened to remove large solids.

The first processes in the treatment cycle take place in the detritor building where the flow passes through one of two barminutors and thence through one of two detritors. The barminutors collect and cut up the larger particles then return the shreddings to the flow. The detritors reduce the velocity of the flow allowing grit, sand, gravel and silty material to settle out. A revolving collector mechanism at the bottom of the detritor draws the settled material to a sump from which a reciprocating rake lifts the material to a gantry bucket for disposal. The rake channel is equipped with two organic return pumps which return the suspended organic material back to the flow.

From the detritor the flow is discharged via a distribution chamber to the four primary sedimentation tanks. Here the flow is detained to allow the heavier solids to settle to the bottom of the tank. The settled solids, or sludge, is removed by revolving mechanical scrapers and is pumped to a holding tank for further processing. The scum which collects on the surface of the settling tanks is removed by skimmer mechanisms and after dewatering is also pumped to the sludge holding tanks.

The effluent from the primary tanks flows by gravity

to the chlorine contact chamber. Chlorine is added at this point and following a short detention period in the chamber, the effluent is discharged via a 54" outfall sewer to the St. Marys River. All bypass flow passes through the chlorine contact chamber and is usually subjected to an increased chlorine dosage.

The raw sludge collected by the primary settling tanks is dewatered by one of two vacuum filters. To operate these units efficiently, they must have a sufficient supply of sludge to run continuously for several hours. Since it is not practical to allow enough sludge to build up in the primary tanks to permit this continuous operation, sludge holding tanks have been employed to retain sludge. These holding tanks are aerated to prevent the raw sludge from becoming septic during its detention period prior to filtration.

Immediately before filtering, the raw sludge is preconditioned with coagulants, lime and ferric chloride, which assist in compacting the sludge on the filter surface. The dewatered sludge or filter cake is discharged to a conveyor which transports it to a skip hoist. The skip raises the filter cake to a hopper for storage until it can be hauled by truck to a disposal site.

PROJECT DESIGN DATA

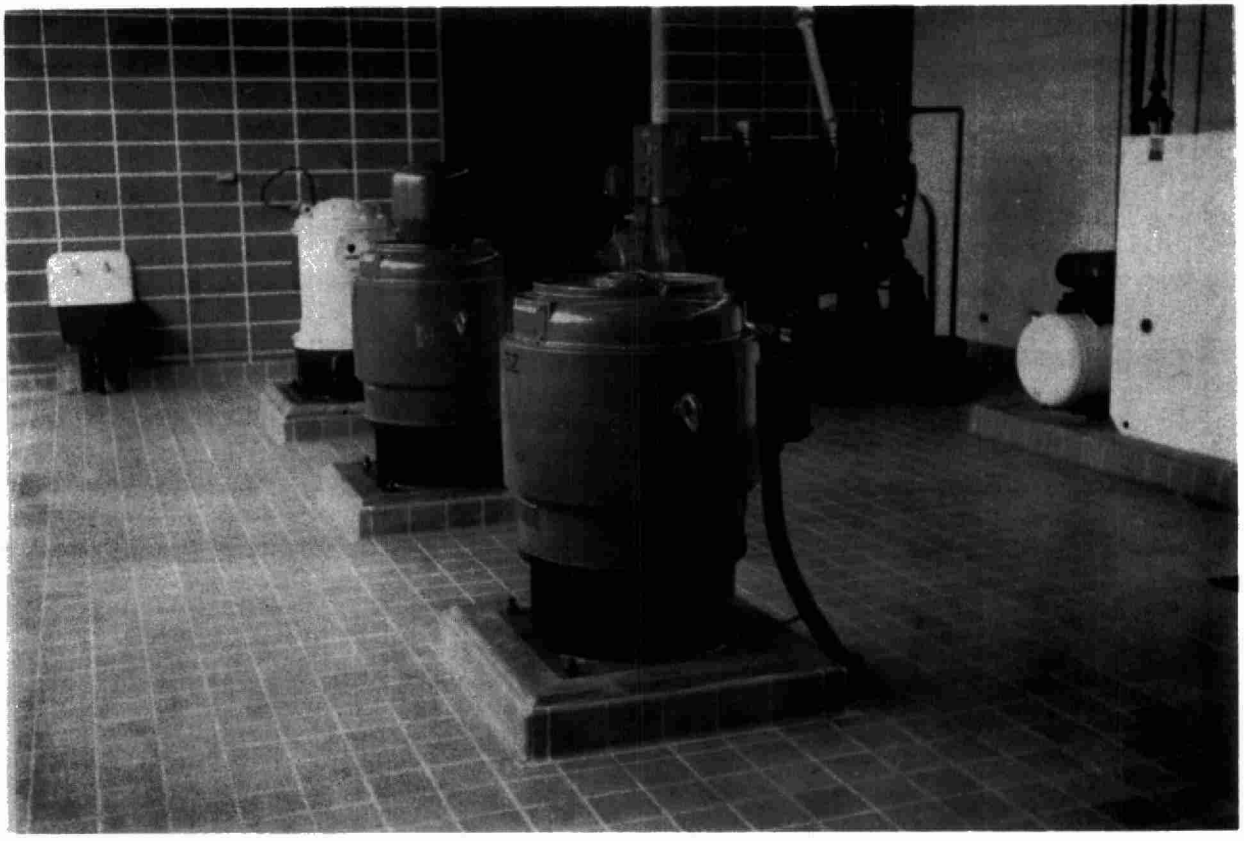
General

The two pumping stations at Pim Street and Clark Creek assist in conveying the wastes from the three municipalities to the treatment plant. Each station is equipped with three Worthington pumps. Two pumps are electrically driven while the third is driven by a standby diesel. Automatic control is carried out at each station by the use of variable speed controllers on the synchronous electric motors.

The sewage treatment plant can presently afford primary treatment to 8 MGD and may be expanded to include secondary treatment for 16 MGD when the need arises. The plant design data is summarized in the following table :-

Design Population	72,500 persons
Per Capita Flow	110 Imp. Gals/day
Design Flow	8 Million Gallons/day
5-day BOD of raw sewage	250 ppm (Estimated removal 35%)
Suspended solids of raw sewage	200 ppm (Estimated removal 60%)

PIM STREET PUMPING STATION & EQUIPMENT



EQUIPMENT SPECIFICATIONS

Pim Street Pumping Station

Pumps - One Worthington 10,000 GPM at 50 ft. TDH driven by a 165 HP Dorman Diesel Engine.

- Two Worthington each 6,300 GPM at 40 ft. TDH driven by a Brooks 75 HP electric motor.

Control - A General Services Company Flow-Matcher variable speed controller coupled to a bubbler system.

Clark Creek Pumping Station

Pumps - One Worthington 15,400 GPM at 40 ft. TDH driven by a 217 HP Dorman Diesel Engine.

- Two Worthington each 8,400 GPM at 28 ft. TDH driven by a Brooks 75 HP electric motor.

Control - A General Services Company Flow-Matcher variable speed controller coupled to a bubbler system.

Treatment Plant

Type of Plant - Primary Treatment - raw sludge vacuum filtration.

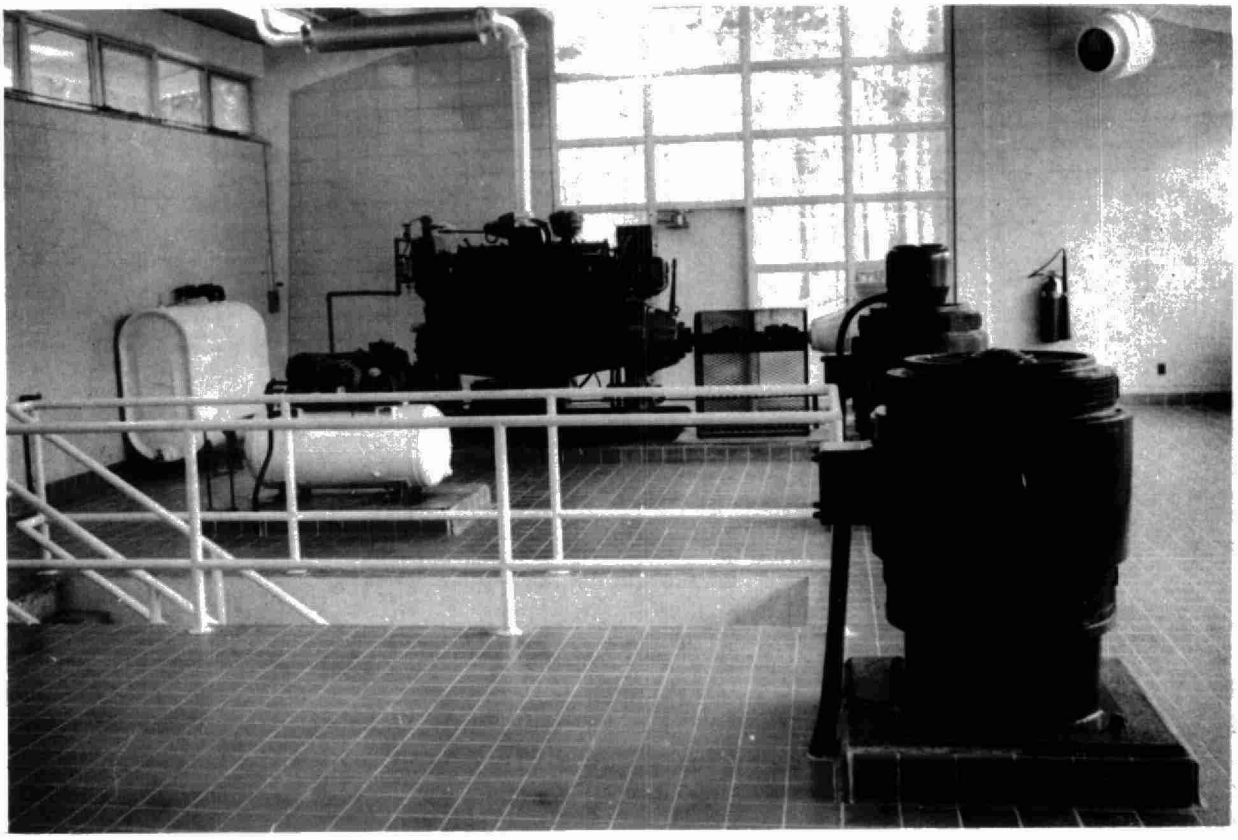
Inlet sewer - 36 inch diameter forcemain.

Metering - Parshall flume :- length 14'-11", throat 4'-0".

Screening - (1) two Chicago Pump Company 36" Model C barminutors.

- (2) coarse bar screen in each by pass channel.

CLARK CREEK PUMPING STATION AND EQUIPMENT



Treatment Plant Cont'd ...

Detritus Removal - Two Dorr-Oliver-Long 18 ft. diameter detritors complete with collecting mechanisms.
- Volume - 6240 Imp. Gallons.
- Detention at design flow - 1.13 minutes.
- Velocity at design flow - 0.209 feet/second.

Primary Clarifiers- four Dorr-Oliver-Long 70 ft. diameter "Squarex"clarifiers complete with scum and sludge removal mechanisms.
- Volume of each - 36,000 cu.ft. or 225,000 Imp. Gals.
- Detention at design flow - 2.3 hours at 8 ft. depth.
- surface settling rate - 520 Imp. Gals./sq. ft./day.
- weir overflow rate - 13,000 Imp. Gals/Lin. ft./day.

Chlorine Contact Chamber - one rectangular 82,000 Imp. Gallon chamber. Contact period at design flow, 14.75 minutes.

Chlorination - one Wallace and Tiernan V-Notch Gas Chlorinator, maximum dosage of 800 lbs./day

Chlorination cont'd ....

- a Cleveland Tramrail Hoist is used to handle the one-ton chlorine cylinders.
- a Fairbanks-Morse 9,000 lb. scale is used to weigh the one ton cylinders.

Aerated Sludge Holding Tank - two rectangular tanks 24' x 15' x 11.5'.

- volume of each tank - 4140 cu.ft. or 25,800 Gals.
- one Sutorbilt 8 HVB blower, driven by a 2.5 HP General Electric induction motor.

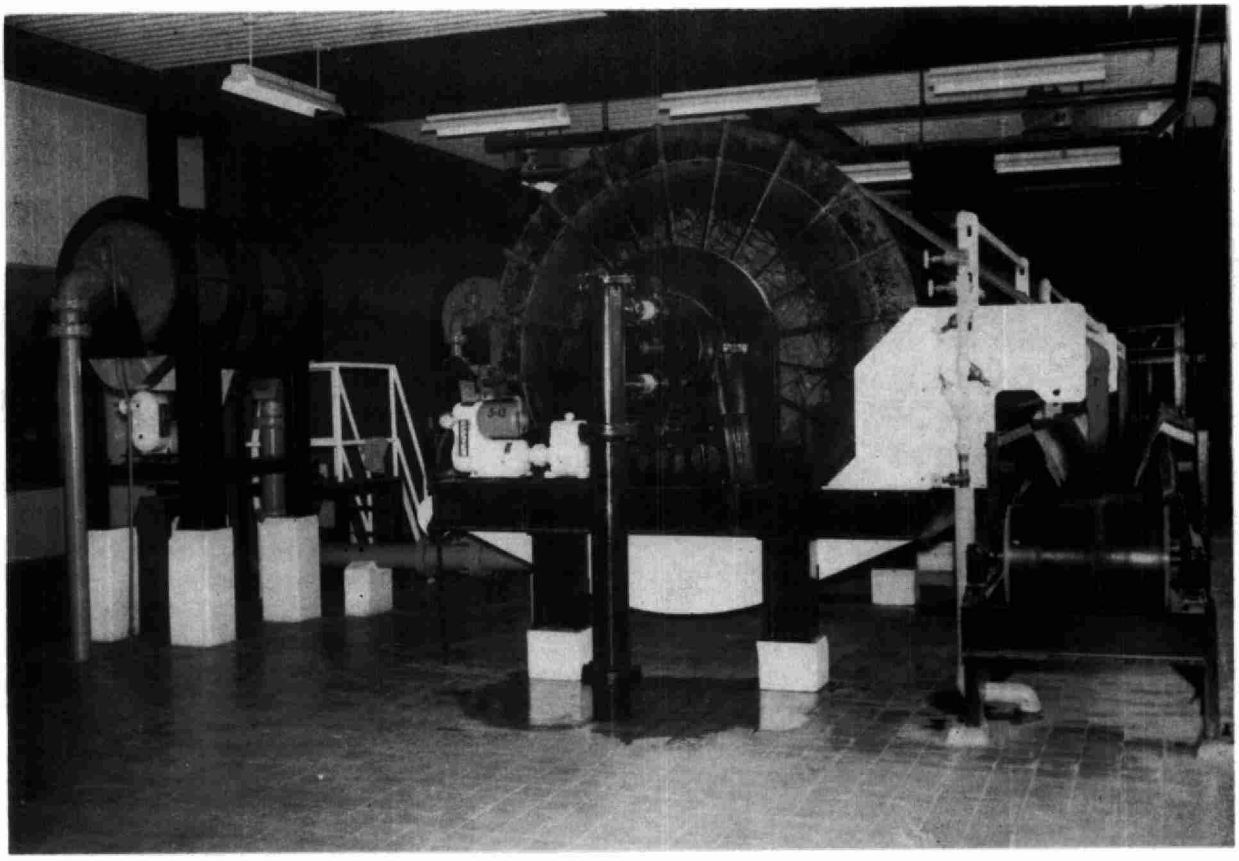
Raw Sludge Vacuum Filtration - two Komline-Sanderson filters, each complete with conditioning tanks and agitators and driven by a Reeves Varispeed motor.

- one Crofts-Bradford Gear Driven conveyor powered by a Brooks 2 HP electric motor.
- one Webster-Smallwood skip-hoist powered by a BEPCO 5 HP motor.

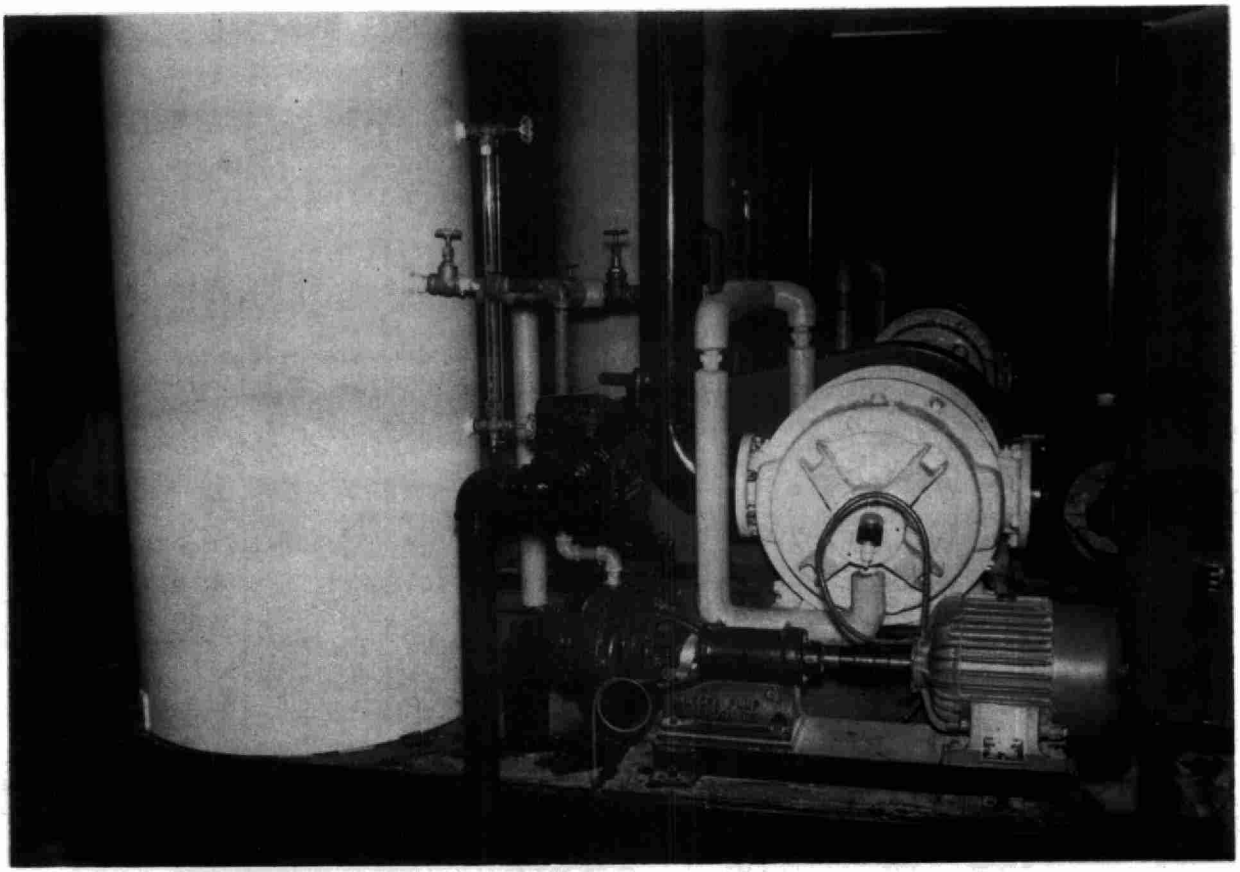
<u>Pumps</u>

(1) four Marlow Plunger Type Raw Sludge Pumps each powered by a 2 HP Leland-Newman motor.

(2) two Komline-Sanderson Plunger Type sludge pumps rated at 60 GPM and each powered by a



VACUUM FILTERS AND EQUIPMENT



Pumps cont'd ...

$1\frac{1}{2}$ HP C.G.E. induction motor.

(3) two Komline-Sanderson diaphragm type lime pumps rated at 20 GPM and each powered by a $\frac{1}{4}$ HP Reeves motor.

(4) two Komline-Sanderson diaphragm type ferric chloride pumps rated at 20 GPM and each powered by a $\frac{1}{4}$ HP Reeves motor.

(5) two Aurora Condensate pumps rated at 75 GPM and each powered by a Bull - E.R. & F. Turner Ltd. 2 HP motor.

(6) two Nash Hytor vacuum pumps each powered by a 30 HP British Thomson-Houston Co. motor.

(7) two Dorr-Oliver-Long organic return pumps each powered by a $\frac{1}{2}$ HP Westinghouse motor.

(8) two Smart Turner sump pumps each powered by a 5 HP CGE motor.

PERSONNEL

Interviews were held in September by Messrs. Caverly, Clark and Uren of the OWRC for the position of plant superintendent. Mr. G. Buckley, the successful applicant commenced duties on October 16, 1961. Later that fall interviews were held to select an additional eight men to staff the new plant. The men and their duties were as follows :-

Plant Mechanic	-	Mr. J. Horsburg
Filter Operation	-	Mr. C. W. Hayes
Shift Operators	-	Mr. A. A. Hopfgartner
		Mr. H. E. Foster
		Mr. R. J. Burns
		Mr. G. Dobson
		Mr. J. G. Valentine
Grounds Keeper	-	Mr. J. E. Bray

In July, one of the shift operators, Mr. Valentine, resigned and was replaced by Mr. R. Nicholson. The increasing workload warranted the hiring in July of Mr. F. Galvin on a casual basis.

During November another shift operator, Mr. Hopfgartner resigned. The increased workload experienced earlier in the year continued, warranting the hiring of a permanent employee to replace the casual as well as a replacement for Mr. Hopfgartner. Mr. R. L. McKinley and Mr. H. W. Blume were chosen from a large number of applicants to complete the plant staff. Mr. Galvin resigned in December and the two new operators commenced their duties at the start of the new year. No additional man-power is envisioned for 1963.

OPERATION - 1962

The sewage plant, even though it incorporates some relatively new processes, has operated successfully during its first year. As can be expected with a new plant, there were many operating problems, most of which have been solved by the competent staff.

In December 1961, before the plant had started processing sewage, Number Two clarifier mechanism sustained severe damage to the scum wiper arm and centre column. This failure was traced to a manufacturers defect and was corrected by them with the assistance of the plant staff.

Several deficiencies in design which hampered operation became evident early in the year. One of these, the difficulty in unloading and storing bagged lime was solved by installing a chute extending from near the unloading platform to the storage room below. Another design deficiency was the absence of a drain in the concrete base of the sludge loading area. This drain was installed by a contractor and is worth its cost in nuisance prevention alone. The large heavy grit bucket proved very difficult to handle and was replaced by a more suitable one. The new bucket has smaller dimensions, holds more and is much easier to handle than the old one.

Considerable trouble has been encountered with the skip-hoist which lifts the filtered sludge to the storage hopper. The first problem was that the bucket would not return down the tracks after dumping. The plant staff corrected this fault by installing stops to relieve the weight off the rear wheels. The breaking of the hoist cable due to its over-

lapping and cutting itself was corrected by modifying the drum so overlapping would not occur. Additional safety and maintenance features were added to facilitate safe and trouble-free operation.

The freezing of filtered sludge in the storage hopper complicated removal to the waiting truck during the winter. Temporary arrangements have been made to ease this problem until a permanent enclosure can be constructed in 1963.

The two sump pumps in the basement plug frequently requiring considerable maintenance. A new open type impeller may solve this problem and the 1963 budget has allowed for the purchase of one of these on a trial basis.

The Johnson right angle gear drive on one of the pumps at the Pim Street Pumping Station caused concern for a long time because of an oil leak which proved very difficult to cure. Finally a new type of seal was installed that has successfully stopped the leak.

Several experiments and modifications were carried out on the sludge thickening tanks and vacuum filters in order to achieve the most efficient operation. The original air diffusers supplied for the sludge holding tank plugged continually necessitating frequent maintenance. Raising these diffusers for cleaning was a very difficult and messy operation due to the build-up of settled sludge around the headers and the fouling with sludge of the cables of the lifting mechanism after the headers were finally freed. This problem was solved by the staff simply by drilling ½ inch holes in the bottom of the air headers and plugging the original diffusers. No problems have occurred since this

modification was implemented.

Experiments were conducted on the vacuum filtering of sludge without aeration as well as with aeration. The results of the non-aerated sludge filtering indicated that approximately twice the amount of lime and ferric chloride was required and twice the time was needed to obtain the same results as with aerated sludge. In addition a septic condition developed in the sludge holding tanks when the air was shut off. Experience has shown that best results are obtained on the vacuum filters with a 10% solution of Ferric Chloride added to the aerated sludge and the pH elevated to 11 with lime. The best operation and the least odour is obtained when the temperature of the sludge mixture is the lowest.

Additional piping has been installed from the raw sludge pumps to the primary clarifier distribution chamber. This allows excess water to be drained off the scum pit and returned to the clarifiers, hence reducing the water content of the sludge to be aerated and filtered.

During a cold period in December, the ferric chloride tank froze. This was thawed out and action is being taken to prevent further problems of this nature. Also during cold weather, the pipes in the valve pit at the sludge holding tanks freeze. A heater has been ordered to keep these lines operational. Considerable trouble has been experienced, especially during cold weather with grease accumulations in the scum pit. An electric water heater has been installed to provide hot water to wash down the pit and equipment which becomes fouled.

As can be seen even from the above, Mr. Buckley and his staff must be complimented for their initiative, persistence and skill in solving the operational problems which occurred during the plant's first year of operation.

The operation of the project is supervised by the Division of Plant Operations which makes periodic inspection visits. The Electronics, Maintenance and Training Sections of the Division assist the plant staff whenever they are required. In March, a complete inspection was made of the buildings, mechanical and electrical equipment and a data card system set up. At this time, the Maintenance Section also dismantled, checked and aligned a sludge filter pump and dismantled lift pump # 2 to remove an obstruction from the impeller.

Another complete inspection of the buildings, mechanical and electrical equipment was made before the warranty period expired in September. Approximately 340 man hours were spent at the project by the Maintenance Section of the Division. All of these services, as well as other OWRC head office services, are at no charge to the municipality.

OPERATING DATA

During 1962 the Sault Ste. Marie Treatment Plant gave primary treatment to approximately 1684 million gallons of sewage. The following data summarizes the plant's operations over 1962. Included are flow results, performance data, solids removal and operating costs.

Flow Results

Table I summarizes the flow characteristics through the plant for the year. This table coupled with Graph I indicates the status of the hydraulic load to which the plant is subjected. The average daily flow is 5.22 MGD and the plant is hydraulically overloaded on a daily basis ten per cent of the time. Graph I would be a straight line if the flows were normally distributed, however, two factors combine to give it the S-shaped effect. Firstly, the flow reaching the plant is limited to approximately 16 MGD by the capabilities of the pumping stations. This tends to flatten out the top part of the graph when the pump capacity is reached. Secondly, the overload occurs almost entirely during a short period in the spring due to the infiltration of surface runoff. The steep sloped section of the curve is indicative of this so-called storm flow. The regular sanitary sewage flow is represented by the gently sloped lower part of the curve.

Performance Data

Table II is a summary of the analyses of the strengths of raw sewage and final effluent. BOD or biochemical oxygen demand is an indication of the oxygen required to stabilize the organic matter in the sewage. SS refers to

TABLE I

FLOW RESULTS

1962

MONTH	TOTAL FLOW (MG)	AV. DAILY FLOW (MG)	MAX. DAILY FLOW (MG)	MIN. DAILY FLOW (MG)	MAX. INST. FLOW (MG)	MIN. INST. FLOW (MG)	AVG. FLOW/ CAPITA/ DAY *
Jan.	NOT	IN	OPERATION	UNTIL	FEBRUARY	9, 1962.	
Feb.	82.76	5.17	5.42	4.71			
Mar.	320.40	10.34	14.63	4.79	20.0	3.5	143
Apr.	207.75	6.93	9.44	5.00	13.5	4.1	95
May	186.97	6.03	12.74	4.30	18.0	3.4	83
June	119.11	3.97	4.57	3.44	6.2	2.8	55
July	110.61	3.57	4.15	2.90	12.3	2.5	49
Aug.	125.93	4.06	9.21	3.18	12.8	2.5	56
Sept.	130.62	4.35	6.73	3.60	13.0	2.4	60
Oct.	136.22	4.39	6.90	3.87	13.5	2.0	60
Nov.	134.44	4.48	5.02	3.80	6.2	2.8	56
Dec.	129.21	4.17	5.29	3.63	5.6	2.1	55
TOTAL:	1684.02						
AVG:	157.68	5.22	7.65	3.93	12.1	2.8	71.2

* Based on design population of 72,500 persons

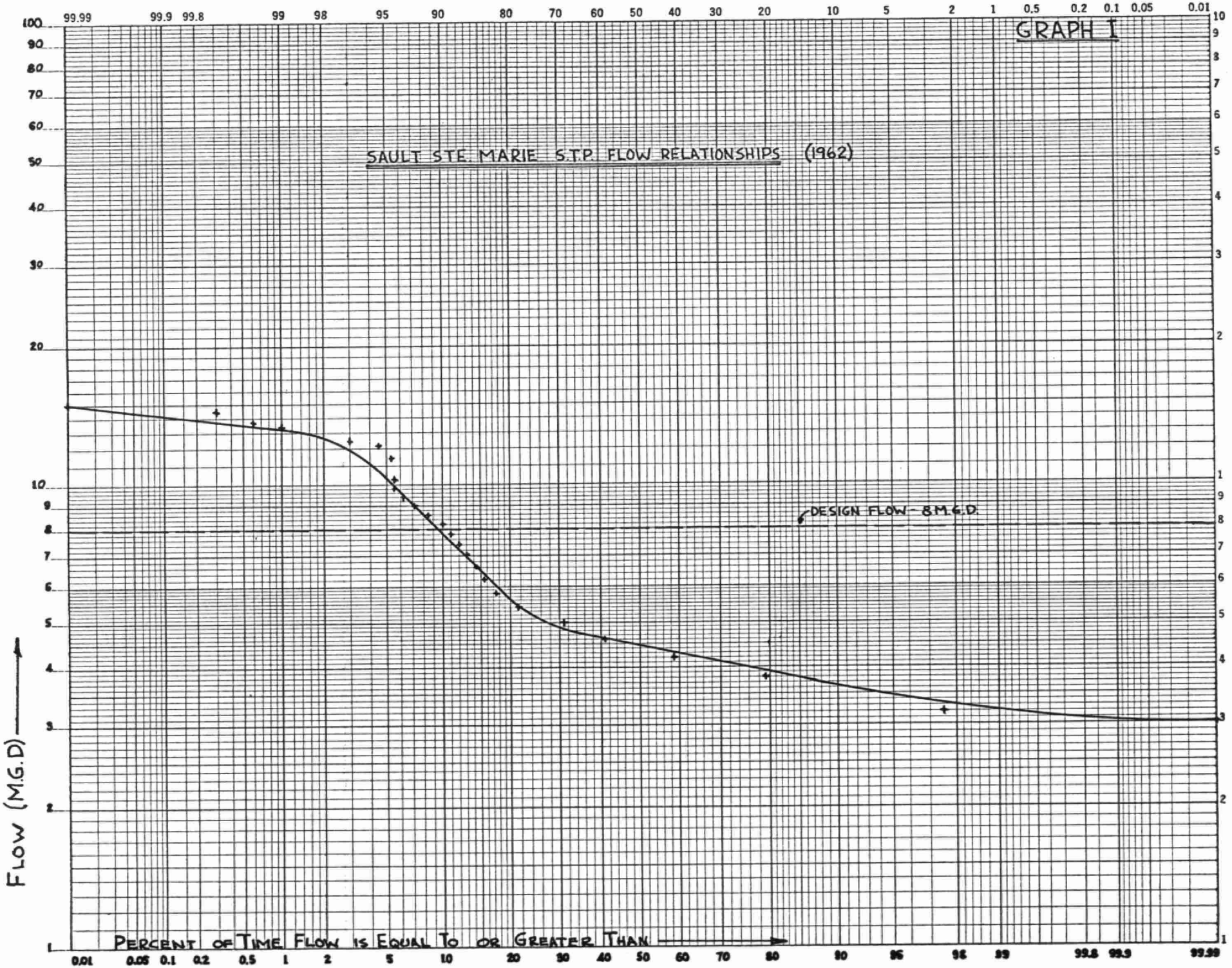
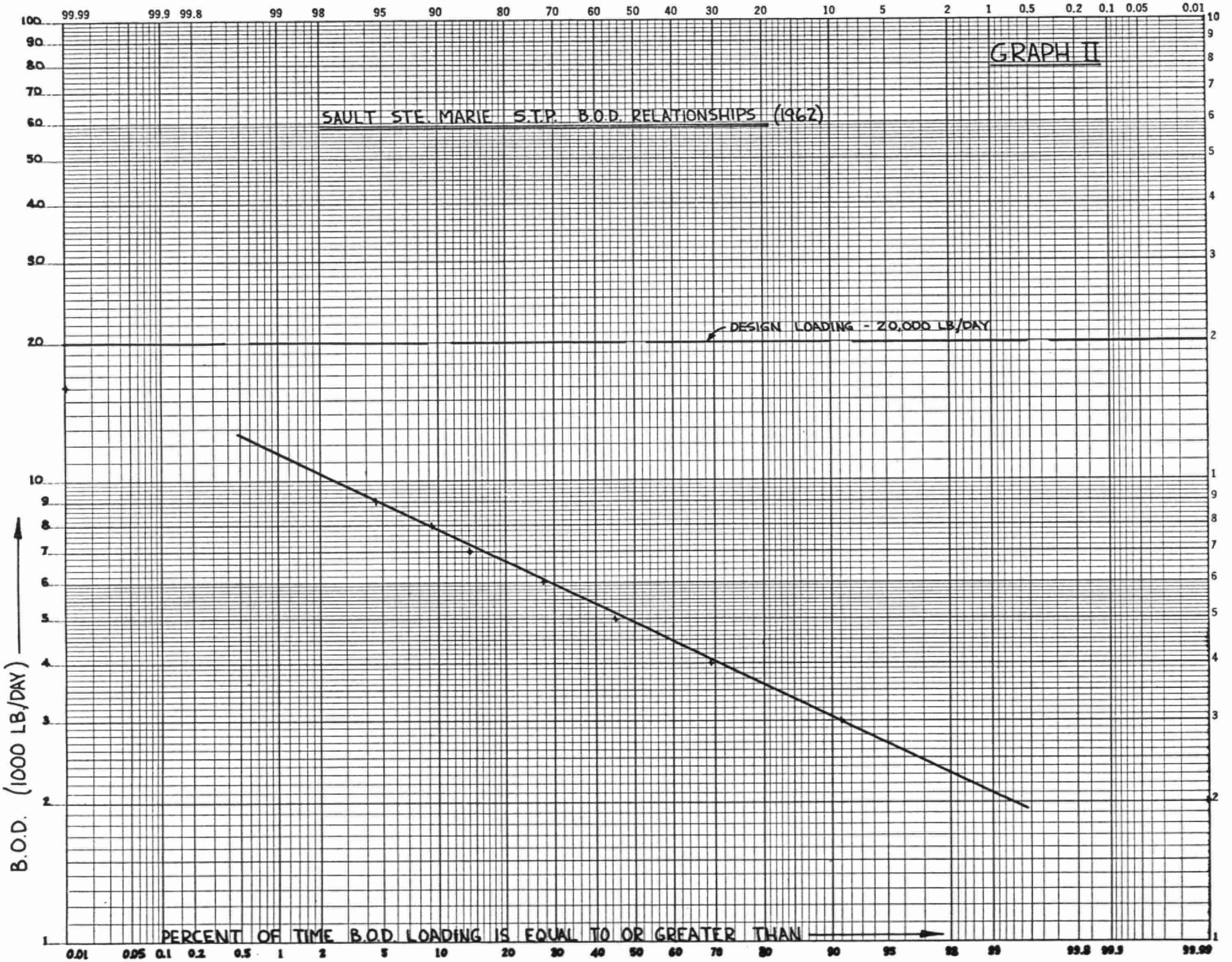

GRAPH I
SAULT STE MARIE S.T.P. FLOW RELATIONSHIPS (1962)
DESIGN FLOW - 8 M.G.D.
FLOW (M.G.D)
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.8 99.9 99.99

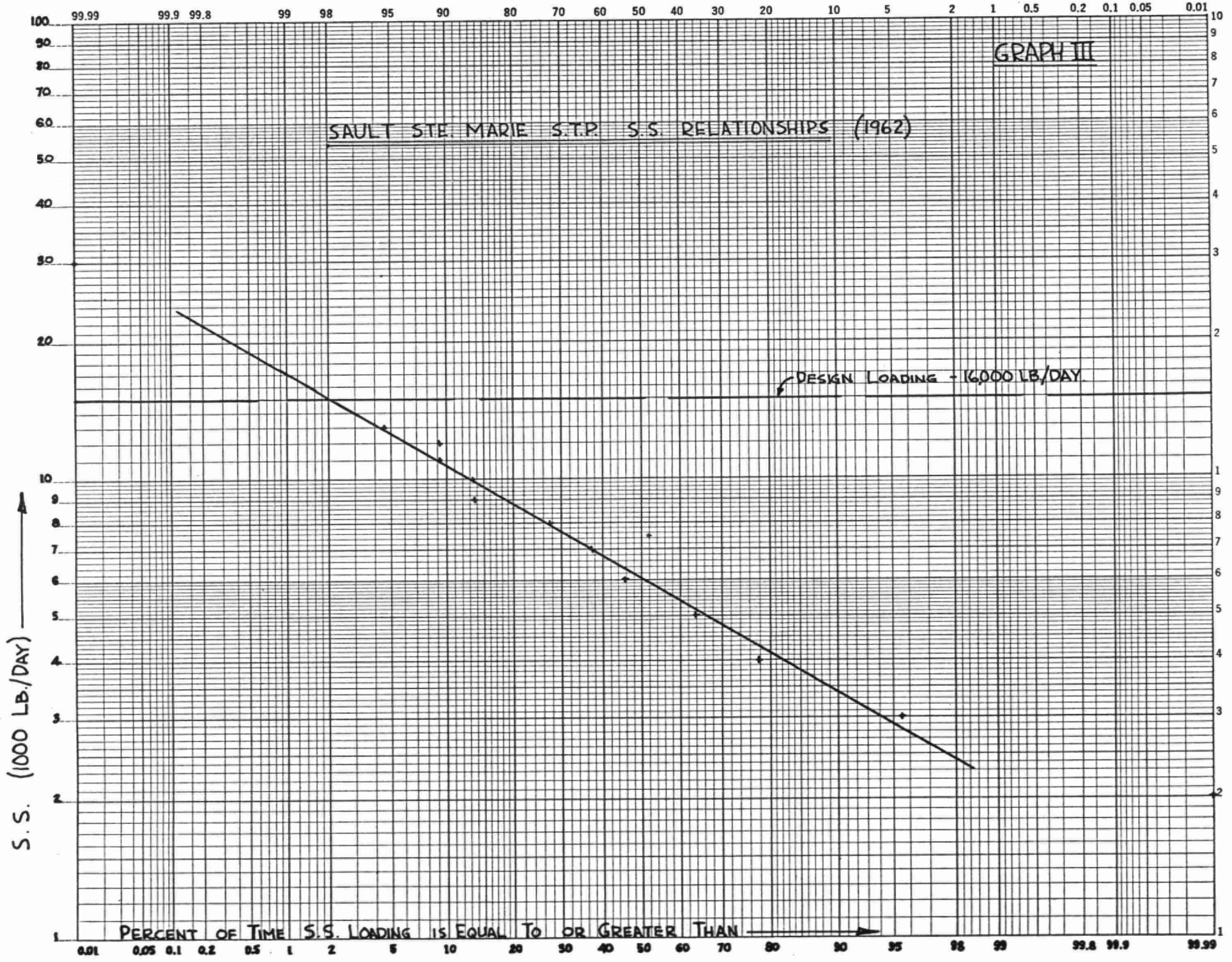
TABLE II

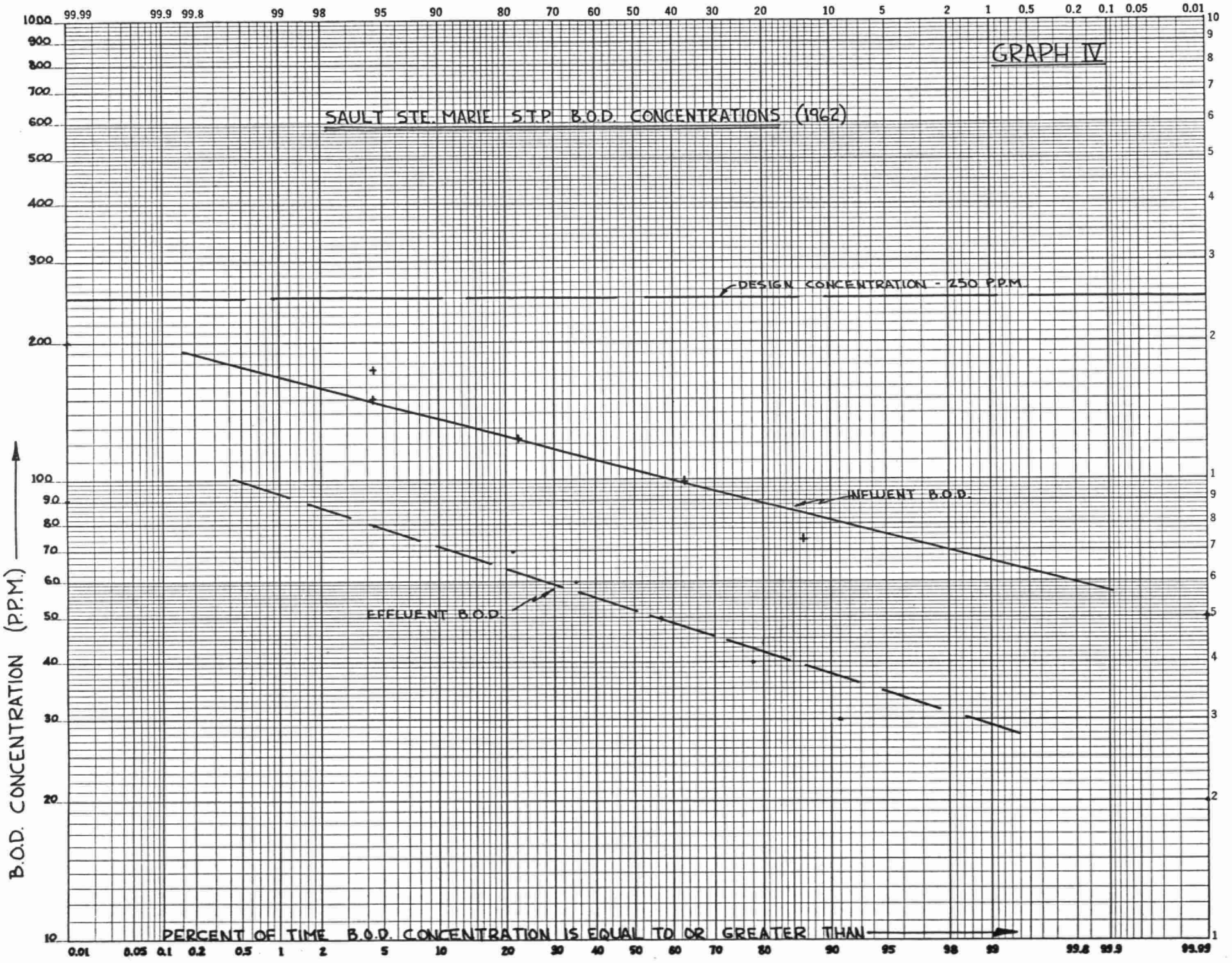
PLANT PERFORMANCE DATA 1962

MONTH	TOTAL FLOW (MG)	INFLUENT		EFFLUENT		% REMOVAL	
		BOD (LBS)	SS (LBS)	BOD (LBS)	SS (LBS)	BOD	SS
an.	NO	RESULTS	AVAILABLE				
b.							
ar.	320.40	417,500	940,000	254,000	297,500	39	69
r.	207.75	212,000	252,000	91,400	97,700	58	61
ay	186.97	187,000	254,000	131,000	194,000	30	24
une	119.11	101,000	101,000	50,000	68,000	49	40
ly	110.61	146,000	166,000	58,500	40,900	54	73
ug.	125.93	129,500	195,000	66,900	64,000	42	65
pt.	130.62	112,000	177,000	52,000	51,000	53	44
ct.	136.22	177,500	177,500	76,200	51,800	57	71
ov.	134.44	173,500	207,000	83,500	71,200	52	66
c.	129.21	110,000	106,200	57,000	73,700	48	31
TAL:	1601.26	1,766,000	2,575,700	920,500	958,000		
G:	160.13	176,600	257,570	92,050	95,800	48.2	54.4

NOTE: Flow results for February have been omitted due to lack of sampling during this month.


GRAPH II
SAULT STE. MARIE S.T.P. B.O.D. RELATIONSHIPS (1962)
DESIGN LOADING - 20,000 LB/DAY
B.O.D. (1000 LB/DAY)
PERCENT OF TIME B.O.D. LOADING IS EQUAL TO OR GREATER THAN
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
100 90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 2 1
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.8 99.9 99.99


GRAPH III
SAULT STE. MARIE S.T.P. S.S. RELATIONSHIPS (1962)
DESIGN LOADING = 16,000 LB/DAY
S.S. (1000 LB./DAY)
PERCENT OF TIME S.S. LOADING IS EQUAL TO OR GREATER THAN
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.8 99.9 99.99


GRAPH IV
SAULT STE. MARIE S.T.P. B.O.D. CONCENTRATIONS (1962)
DESIGN CONCENTRATION - 250 P.P.M.
INFLUENT B.O.D.
EFFLUENT B.O.D.
B.O.D. CONCENTRATION (P.P.M.)
PERCENT OF TIME B.O.D. CONCENTRATION IS EQUAL TO OR GREATER THAN
1000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
10
99.99
99.9
99.8
99
98
95
90
80
70
60
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0.2
0.1
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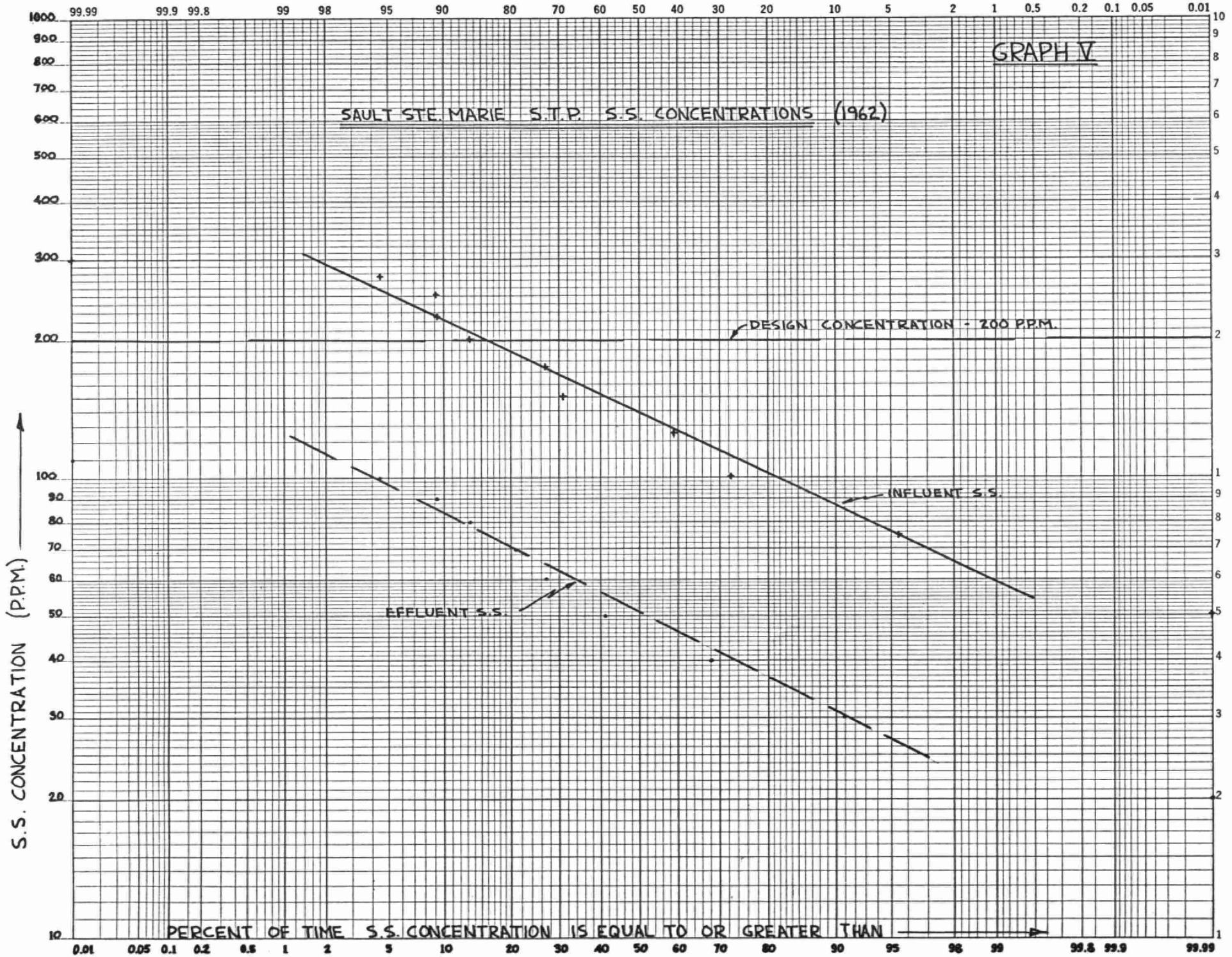
99.99


GRAPH V.
SAULT STE. MARIE S.T.P. S.S. CONCENTRATIONS (1962)
DESIGN CONCENTRATION - 200 P.P.M.
INFLUENT S.S.
EFFLUENT S.S.
S.S. CONCENTRATION (P.P.M.)
PERCENT OF TIME S.S. CONCENTRATION IS EQUAL TO OR GREATER THAN
1000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
10
99.99
99.9
99.8
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
0.05
0.01

the suspended solids in the sewage.

The average BOD concentration during 1962 was 110 ppm which is equivalent to a loading of 5800 lbs./day at the average plant flow. The plant is designed to treat a BOD concentration of 250 ppm or 20,000 lbs./day at design flow. Similarly the plant is designed to treat an SS concentration of 200 ppm or 16,000 lbs./day at design flow. The actual average SS concentration was 163 ppm which is equivalent to 8550 lbs./day at the average plant flow.

The plant was expected to remove 35% of the design BOD loading and 60% of the design SS loading. The sample results indicate that the BOD removals are considerably above the expected but the SS removals are slightly below.

Table II coupled with Graphs II, III, IV and V are helpful in determining the status of the organic loading on the plant. It can be seen that the plant is operating much below its organic load capacity.

Solids Removal

Table III summarizes the solids removal in the form of grit and filtered sludge. The grit removed is quite small considering that many of the sewers are combined. A study of 22 municipalities with 50% or more of their sewers combined showed an average 2.85 cu.ft. of grit per million gallons of sewage.

The filter operation appears to be quite efficient both from the removal and economic view-points. The cost of filter operation per ton of dry solids filtered is slightly lower than other OWRC operated filters. The removal

TABLE III

SOLIDS REMOVAL 1962

MONTH	GRIT REMOVAL		VACUUM FILTER OPERATION			
	CU. FT. REMOVED	CU.FT.REMOVED PER M.G.SEWAGE	DRY SOLIDS FILTERED (TONS)	TONS FILTERED / M.G. SEWAGE	COST OF FILTER OPERATION/TON OF DRY SOLIDS FILTERED	TOTAL COST OF FILTER OPER.
Jan.	PLANT	NOT IN	OPERATION	UNTIL	FEBRUARY 9, 1962	
eb.	17	.21				
Mar.	188	.59	131.97	.41	$ 5.54	$ 762
pr.	216 *	1.05 *	140.09	.68	6.16	764
y	299	1.60	151.36	.81	6.79	1025
June	150	1.26	127.51	1.07	6.93	884
ly	177	1.60	119.55	1.08	7.60	909
ug.	548	4.36	177.51	1.41	5.95	1055
pt.	176	1.29	140.31	1.03	7.48	1053
t.	156	1.14	167.62	1.23	6.98	1168
ov.	93	.69	135.86	1.01	6.94	940
c.	65	.50	119.66	.93	7.62	916
TAL:	2085		1411.44			$ 9476
G:	1.95	1.30	141.14	0.97	$6.80	$ 948

* Estimated due to incomplete data

efficiency cannot be compared since the other OWRC plants have either secondary treatment or digestion preceeding the filter operation.

Chlorine Consumption and Water Requirements

Chlorination of the final effluent from June 1 until December 5 required 58,515 lbs. of chlorine. This is an average dosage rate of 7.5 ppm. Chlorination will be carried out from May 15 until October 15.

The water consumption during 1962 was 576,700 cu.ft. or 3,600,000 gallons. This consumption could be reduced appreciably if more use could be made of the effluent. The purchase of a centrifugal pump as recommended would allow more extensive use of effluent in lawn watering and washing down the tanks.

Operating Costs

The Sault Ste. Marie Treatment Plant was operated at a cost reasonably close to the forecast. It must be taken into consideration that it is very difficult to budget accurately for a new plant. Following is a comparison between the 1962 forecast and the actual expenses.

ITEM	FORECAST 1962	EXPENDITURES 1962
Payroll	$ 43,000	$ 41,625.07
Casual Payroll	------	1,813.34
Fuel	1,800	2,542.00
Power	16,500	12,911.52
Water	------	893.89

cont'd .....

ITEM	FORECAST 1962	EXPENDITURES 1962
Chemicals	$ 6,000	$ 16,381.96
General Supplies	1,400	4,595.79
Equipment	4,000	3,131.67
Maintenance & Repair	3,000	800.42
Sludge Haulage	3,750	5,823.05
Sundry	4,000	2,496.20
Insurance & Taxes	6,000	3,444.36
Contingency	2,550	--------
	$ 92,000.00	$ 96,491.83

Table IV is a summary of the monthly operating expenses for 1962.

SUMMARY OF COST DATA

The total construction cost for this project OWRC 58-S-20 was $ 3,234,826.00 which was divided as follows :-

Trunk Sewers and forcemains	$ 1,301,118.00
Two pumping stations	459,691.00
Sewage treatment plant	820,000.00
Equipment	308,441.00
Engineering fees	175,000.00
O.M.B. fees and interest throughout construction.	174,768.00
Miscellaneous (soil investigations, restoration of asphalt, etc.)	57,708.00
TOTAL:	$ 3,296,726.00
Less Winter Works Payment	60,600.00
Less Capital prepayment	1,300.00
Final Costs (as of Dec. 31/61)	$ 3,324,826.00

1. Per Capita Cost - 60,000 persons

(a)	Capital Cost	$ 53.90
(b)	Annual Costs (1962)	
	Operating	1.61
	Debt retirement, interest, reserve.	4.59
		$ 6.29

2. Treatment Costs (1962)

(a)	Cost per million gallons (including debt retirement, etc.)	$220.75
	Cost per million gallons (Operational cost only)	$ 57.30
(b)	Cost per lb. of BOD removed (Operational costs only including pumping stations.)	$ 0.05
	Cost per lb. of SS removed (operational costs only including pumping stations.)	$ 0.04

The foregoing costs are not necessarily exact and are meant for general information only.

RECOMMENDATIONS:

The following items are recommended for incorporation into the plant during 1963.

1. An enclosure (possibly heated) for the sludge loading area is required to eliminate the problem of sludge freezing in the storage hopper.

2. Modification of the pumping station wet wells are needed to control or prevent the buildup of sludge on the well bottom. A rudder type gate has been proposed as one means of solving this problem.

3. A 3-inch centrifugal pump would be of great assistance for such jobs as pumping out and washing down the clarifiers, wet wells and contact chamber with effluent. At present a pump must be rented or borrowed and is not always available when needed.

4. The driveway should be modified to enable large delivery trucks to reach the plant more easily. The present layout allows trucks to reach the unloading platform only after much shunting back and forth.